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Santa Clara Valley Water District

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SANTA CLARA VALLEY WATER DISTRICT

WATER CONDITIONS
1983-84

by

Isabel S. Gloege, P. E.
Associate Civil Engineer
Water Supply Planning Division

assisted by

Ted W. Cassidy
Assistant Civil Engineer
Water Supply Planning Division

Edwin E. Ferguson
Head, Water Facilities Branch
Water Supply

Richard Pardini, P. E.
Division Engineer
Water Supply Planning Division

John T. O'Halloran
General Manager

David K. Gill
Water Supply Manager

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I. SUMMARY OF 1983-84 WATER CONDITIONS

During the period October 1, 1983 through September 30, 1984, precipitation was below average in the Santa Clara Valley, Coyote and Llagas Subbasins. As a consequence, the volume of groundwater in storage in the subbasins decreased over the previous year. The Santa Clara Valley Subbasin at the end of 1983-84 showed a decrease in the volume of groundwater in storage of 36 thousand acre-feet. In the Coyote Groundwater Subbasin, the volume of water in storage decreased by four thousand acre-feet and the Llagas Groundwater Subbasin showed a decrease of twenty-one thousand acre-feet.

The volume of water stored in the District's conservation reservoirs decreased during the same period by thirty-seven thousand acre-feet. Only Coyote, Pacheco and Guadalupe reservoirs were full at some time during 1983-84. Of the thirty-seven thousand acre-feet, the Gavilan Water District reservoirs accounted for a decrease of eight thousand acre-feet.

During the 1984 fiscal year, the District imported 96 thousand acre-feet of water through the South Bay Aqueduct. The Rinconada Water Treatment Plant treated 52 thousand acre-feet of this water and the Penitencia Water Treatment Plant treated 28 thousand acre-feet. Sixteen thousand acre-feet were released for groundwater recharge or direct use. Hetch Hetchy deliveries to Santa Clara County amounted to 67 thousand acre-feet during 1983-84.

Significant subsidence has been effectively halted since 1969. This is the result of groundwater levels having risen above and having remained above the critical pressure elevation.

As of September 30, 1984 about 85 incidents of groundwater contamination from hazardous materials were identified. Of these, two cases are of particular concern because of their potential to readily contaminate the deeper, confined portion of the groundwater basin which supplies water supply wells.

Groundwater is monitored frequently and AB1803 is also requiring that all private and municipal treated water retailers test representative wells in the respective water systems.

II. INTRODUCTION

A major objective of the District's water resources management program is to coordinate and optimize the use of the District's total water supplies, including local surface water, groundwater, imported water, and reclaimed wastewater, and to protect water quality. One aspect of the program is the monitoring and evaluating water use and water supplies, including analyzing and updating projected water needs, and planning and implementing projects to meet the needs of the County. The monitoring of the water use and water supplies is the subject of this annual report which covers the period from October 1, 1983 to September 30, 1984, the water year. All data in the report refer to this period. Its purpose is to inform the District Board of Directors and interested citizens of the condition of the County's water resources. The report deals with all the components of the hydrologic cycle.

The three major groundwater subbasins within the District are the Santa Clara Valley, Coyote, and Llagas Subbasins as shown on Plate 1. They are interconnected and occupy about 375 square miles or nearly 30 percent of the total County area. Groundwater supplies about half of the total water used in the Santa Clara Valley Subbasin and almost all of that used in the Coyote and Llagas Subbasins. The remainder is supplied from local surface diversions and imported sources.

Zones of benefit have been established for the conservation, importation, treatment and distribution of water used in Santa Clara County and are shown on Plate 1.

Zone W-2 encompasses the Santa Clara Valley Groundwater Subbasin and was formed for the registration of those groundwater producing facilities that benefit from recharge of the groundwater basin by the District with local and imported water. In this zone, a charge is levied for groundwater extracted and the revenue thus derived is used to support the District's conservation and importation program.

Two major sources of water supply income are the groundwater charge levied in Zone W-2 and the sale of treated water. The groundwater charge for nonagricultural

uses during 1983-84 was $80 an acre-foot. For agricultural uses the groundwater charge was $20.00 an acre-foot. Treated water was sold at $150 an acre-foot, with water in excess of contracted amounts sold at $105 an acre-foot.

In 1983-84, the District received about one fourth of its normal revenue from ad valorem property taxes of which about 35% constituted the District's portion of the one percent Countywide tax revenue as allocated by the County Assessor in accordance with State Senate Bill 154. In addition to the allocation, the District levied taxes in Zone W-1 to pay debt service on general obligation bonds authorized in 1963 and levied a State Water Project Tax throughout the County to pay for a portion of the costs of importing water from the State through the South Bay Aqueduct. Also in 1983-84, the District was authorized to issue $33 million dollars in revenue bonds.

III. HYDROLOGIC BALANCE

Seasonal rainfall in Santa Clara Valley was below average in 1983-84. The San Jose Municipal Weather Station No. 86, which averages 14.2 inches per year, based on 110 years of record, recorded 13.3 inches which is 93 percent of normal. At Station No. 75 in Gilroy, which averages 19.3 inches, 15.2 inches were recorded which is 79 percent of normal.

As of September 30, 1984, the amount of water in storage in all the reservoirs was 80,000 acre-feet or 32 percent less than the 117,000 acre-feet in storage on the same date of the preceding year.

With 1983-84 rainfall below average, the volume of groundwater in storage in the Santa Clara Valley, Coyote and Llagas Groundwater Subbasins decreased. As water levels rise and fall, the volume in storage changes. This year, water in storage in the Santa Clara Valley Groundwater Subbasin decreased by 36,000 acre-feet. In the Coyote Subbasin, the volume of water in storage decreased by 4,000 acre-feet and in the Llagas Subbasin the volume of water in storage decreased by 21,000 acre-feet.

These changes of stored water in the unconfined zone were estimated by multiplying estimates of the storage capacity for the aquifer materials by the area and by the change in depth between groundwater levels at the beginning and end of the season. A map showing lines of equal change in groundwater levels is shown in Plate 3. Another method of calculating the changes of groundwater in storage is by balancing the hydrologic components of water supply and utilization. Water supply consists of precipitation, stream inflow, imported water, and subsurface inflow. Water is utilized or lost by consumptive use, sewage export, stream outflow, and subsurface outflow. The difference between supply and utilization is the net surplus or deficit of water in storage in the groundwater reservoirs at the end of the season. The hydrologic cycle is illustrated in Figure 1.

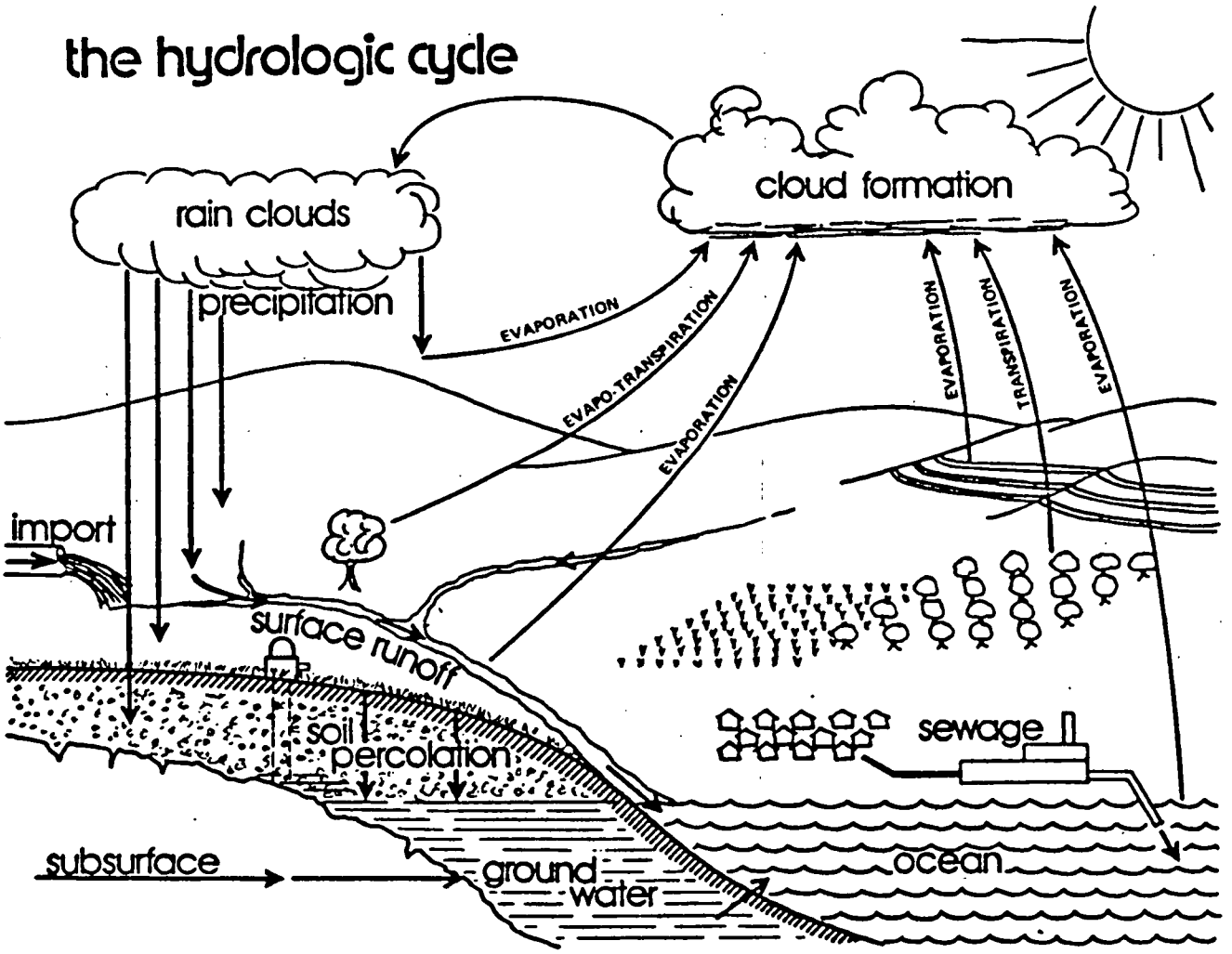
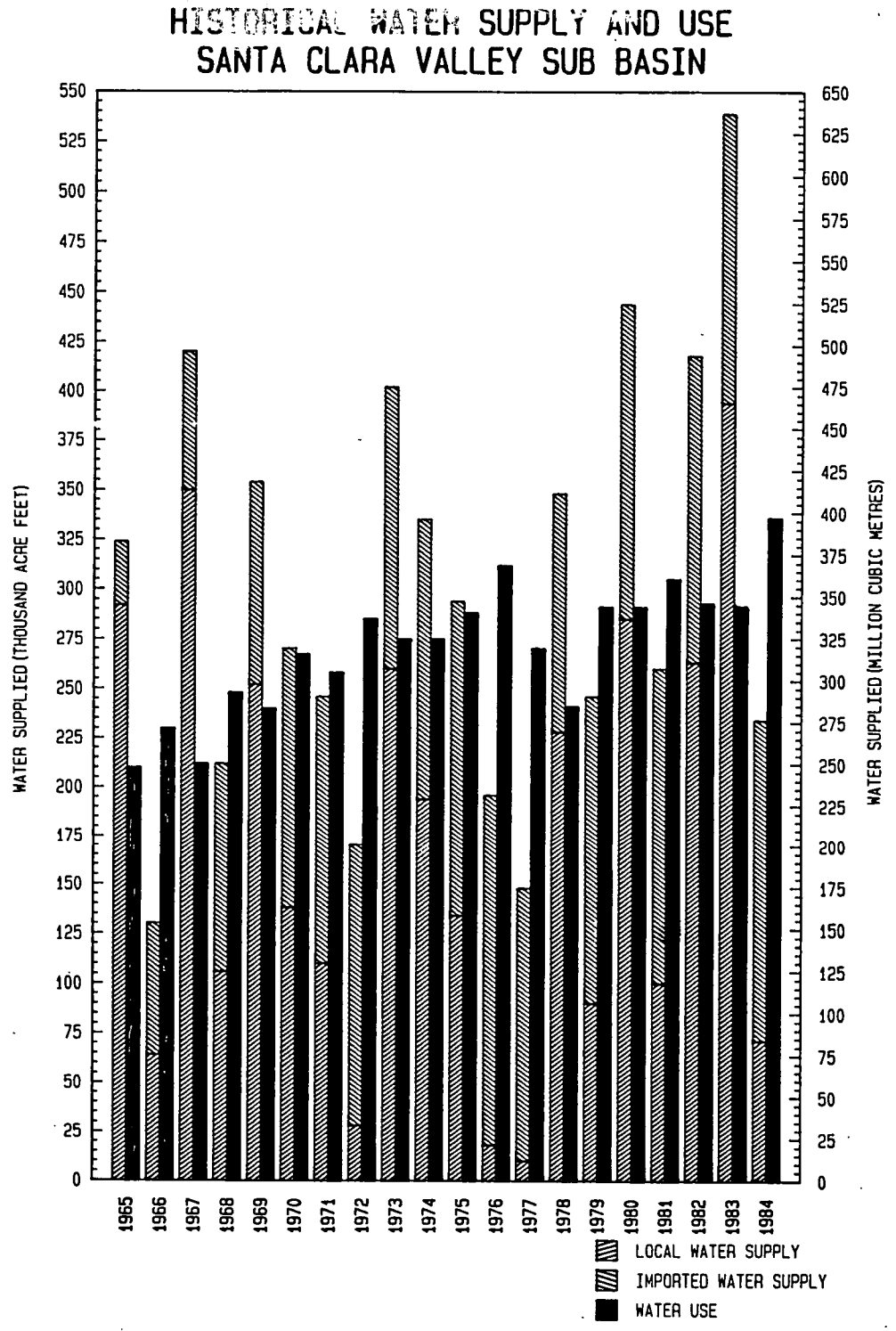

the hydrologic cycle
rain clouds
cloud formation
precipitation
EVAPORATION
EVAPO-TRANSPIRATION
EVAPORATION
EVAPORATION
TRANSPIRATION
EVAPORATION
import
surface runoff
soil
percolation
sewage
subsurface
ground
water
ocean

FIGURE 1

Shown on Figure 2 is the historical total amount of water supply available from local and imported sources and the total amount of water use for the period 1965 through 1984 in the Santa Clara Valley Subbasin area, and rainfall data for the same period.

Local water sources include groundwater produced from the Santa Clara Valley Groundwater Subbasin and surface water deliveries including San Jose Water Company diversions. The groundwater production does not include the amount of SBA water used for groundwater recharge which was 14,000 acre-feet. The imported water deliveries consist of San Francisco Water Department water delivered through the Hetch Hetchy Aqueduct, which began in Santa Clara County in 1952, and deliveries from the State Water Project through the South Bay Aqueduct which started in June 1965.

Actual water production in Santa Clara Valley Subbasin for the period 1970 through 1984 from all sources of supply is summarized in Table 1. Total supply and use for 1983-84 is illustrated in Figure 3. This figure differs from similar graphic representation included in the Water Utility Enterprise report because data was revised since publication of that report.


HISTORICAL WATER SUPPLY AND USE
SANTA CLARA VALLEY SUB BASIN
WATER SUPPLIED (THOUSAND ACRE FEET)
WATER SUPPLIED (MILLION CUBIC METRES)
0
25
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
425
450
475
500
525
550
575
600
625
650
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
LOCAL WATER SUPPLY
IMPORTED WATER SUPPLY
WATER USE

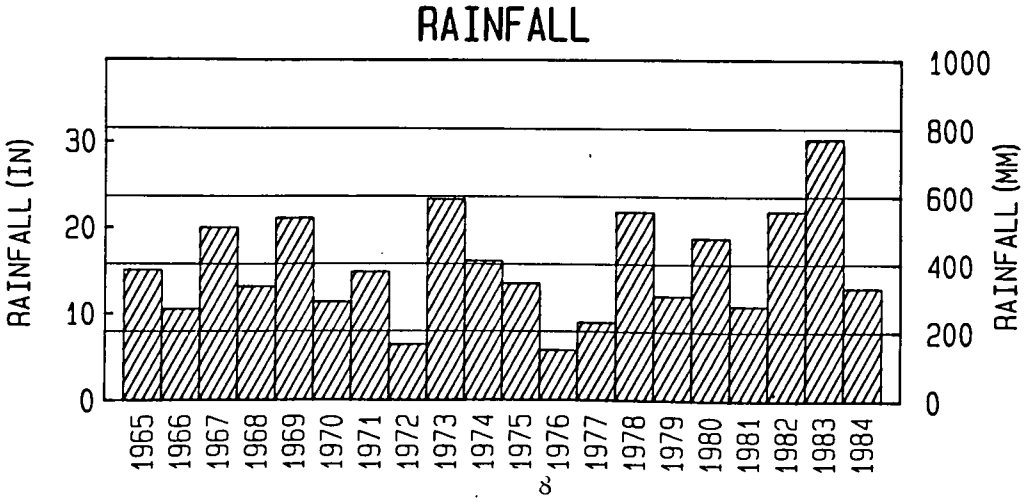

RAINFALL
RAINFALL (IN)
RAINFALL (MM)
0
10
20
30
0
200
400
600
800
1000
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984

FIGURE 2

TABLE 1

WATER USE SUMMARY

SANTA CLARA GROUNDWATER SUBBASIN
(Values in thousand acre-feet)

Year	Surface Water Ag	Surface Water Non-Ag	Groundwater AG	Groundwater Non-Ag	Distribution of SBA Import* Treated	Distribution of SBA Import* Untreated	Hetch Hetchy	SJWCo. Diversion	Total
64-65	5.6		37.9	119.6			29.5	13.0**	205.7
65-66	11.6		38.5	130.8		***	33.6	12.4**	226.9
66-67	3.4		28.9	127.6		***	35.8	12.8**	208.4
67-68	9.1		35.5	138.3	7.9	***	39.9	13.9**	244.5
68-69	8.3		28.5	135.1	11.2	***	41.7	12.9**	237.6
69-70	4.9	0.8	29.3	125.1	39.2	0.5	48.3	15.8	263.8
70-71	4.4	1.1	23.7	124.3	44.0	0.7	45.2	12.9	256.3
71-72	4.8	1.5	24.0	142.1	48.8	0.8	50.1	8.8	280.7
72-73	4.2	1.6	17.5	137.7	45.0	0.6	48.9	14.6	270.1
73-74	3.0	1.8	15.9	129.0	45.5	0.6	52.2	20.8	268.7
74-75	3.5	1.9	16.9	120.4	67.4	0.6	53.3	17.5	281.4
75-76	5.0	2.0	20.0	148.4	66.1	0.8	56.8	8.5	307.7
76-77	2.5	1.5	16.7	136.0	60.4	0.7	47.7	0.7	266.3
77-78	2.4	1.5	11.7	115.4	59.5	0.8	37.3	10.0	238.6
78-79	2.5	1.9	12.0	137.7	66.7	0.7	50.6	15.5	287.6
79-80	2.2	1.4	9.8	139.3	71.3	0.7	51.0	14.3	290.0
80-81	2.0	1.5	9.6	151.2	72.2	0.8	57.5	7.4	302.2
81-82	1.6	1.9	7.2	139.8	67.5	0.5	59.3	14.8	292.6
82-83	0.8	0.7	5.9	139.7	72.1	0.8	58.2	14.2	292.4
83-84	0.7	0.5	6.5	137.5	80.0	0.7	67.2	14.1	307.2

* Imported SBA Water recharged to the groundwater basin included in groundwater used (14,000 acre-feet in 1983-84).
** Includes non-ag surface water deliveries.
*** SBA deliveries included in groundwater used.

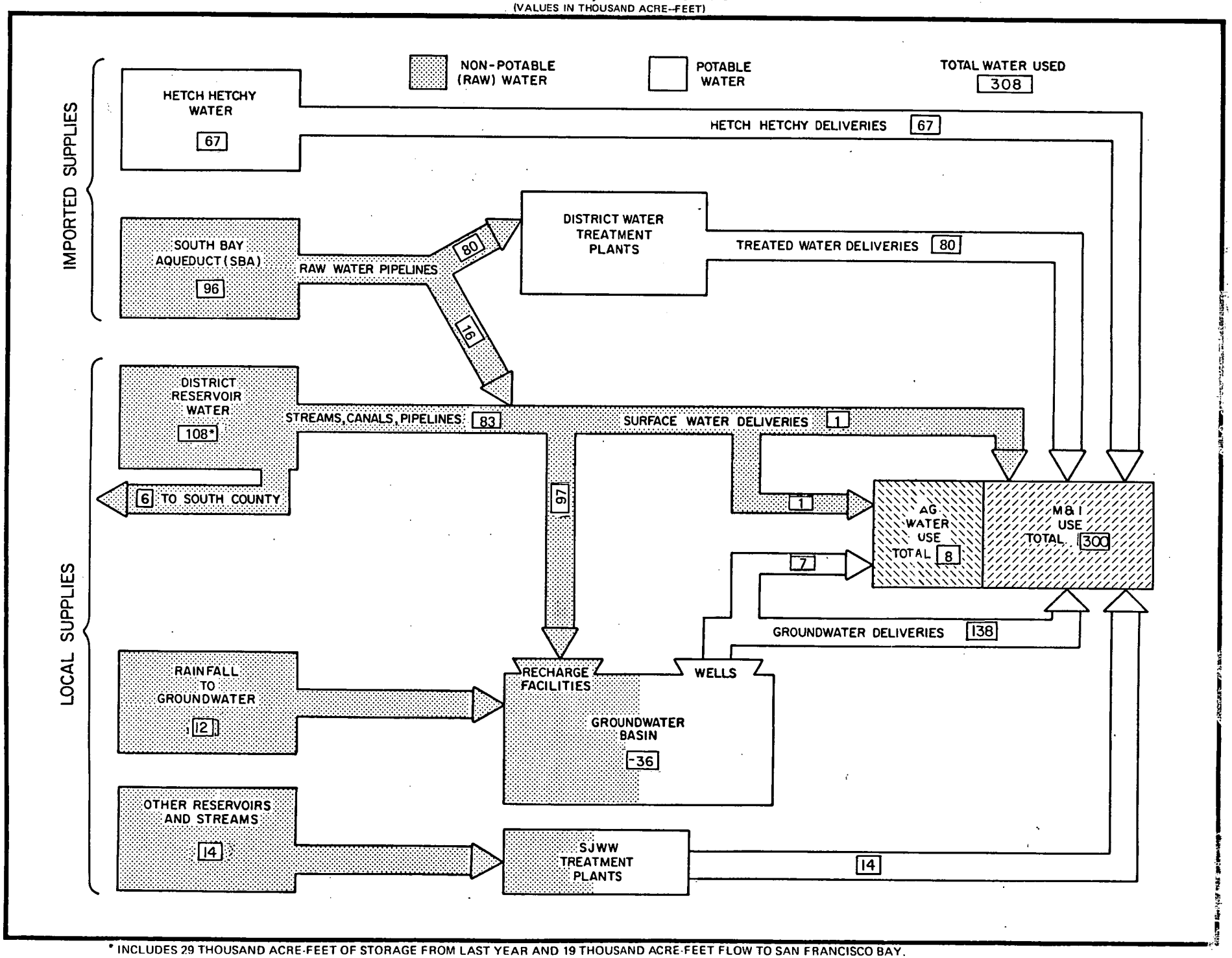
21R136t

1983-84

WATER SUPPLY AND USE

Santa Clara Valley Groundwater Sub Basin

(VALUES IN THOUSAND ACRE-FEET)



* INCLUDES 29 THOUSAND ACRE-FEET OF STORAGE FROM LAST YEAR AND 19 THOUSAND ACRE-FEET FLOW TO SAN FRANCISCO BAY.

FIGURE 3

IV. WATER SUPPLY

A. Groundwater

Groundwater Levels

A groundwater contour map, showing lines of equal elevation of water levels in wells as of September 1, 1984 (traditionally the seasonal low) is shown on Plate 2. Plate 3 shows lines of equal change in elevation of water in wells between September 1983 and September 1984. Groundwater levels (determined from the unconfined area of the groundwater contour map) for the Santa Clara Valley Subbasin show a decrease of 11.0 feet from 1983 levels, the Coyote Subbasin show a decrease of 9.7 feet and the Llagas Subbasin a decrease of 12.2 feet. Plate 4 shows lines of equal depth to water as of September 1, 1984. These groundwater contours are based on information from more than 350 wells.

An index of the monthly fluctuation of water levels from 1963 to 1984 in the Santa Clara Valley, Coyote, and Llagas Subbasins is presented in Figure 4. Well Nos. 07S01E07R99 and 10S03E13D03 are the well hydrographs used to represent trends in the Santa Clara Valley and Llagas Groundwater Subbasins, respectively. The Coyote Subbasin is represented on Figure 4 by the weighted average depths to water in four representative wells, which are monitored at the beginning of each month. These weighted averages are indexes and as such do not represent the actual depth to water at any point within this basin. The intent of Figure 4 is to show trends in the change of groundwater levels in the subbasins over the years.

Groundwater Recharge

The District, as part of its ongoing water management program, recharges the Santa Clara Valley, Coyote, and Llagas Groundwater Subbasins with imported water and or local water.

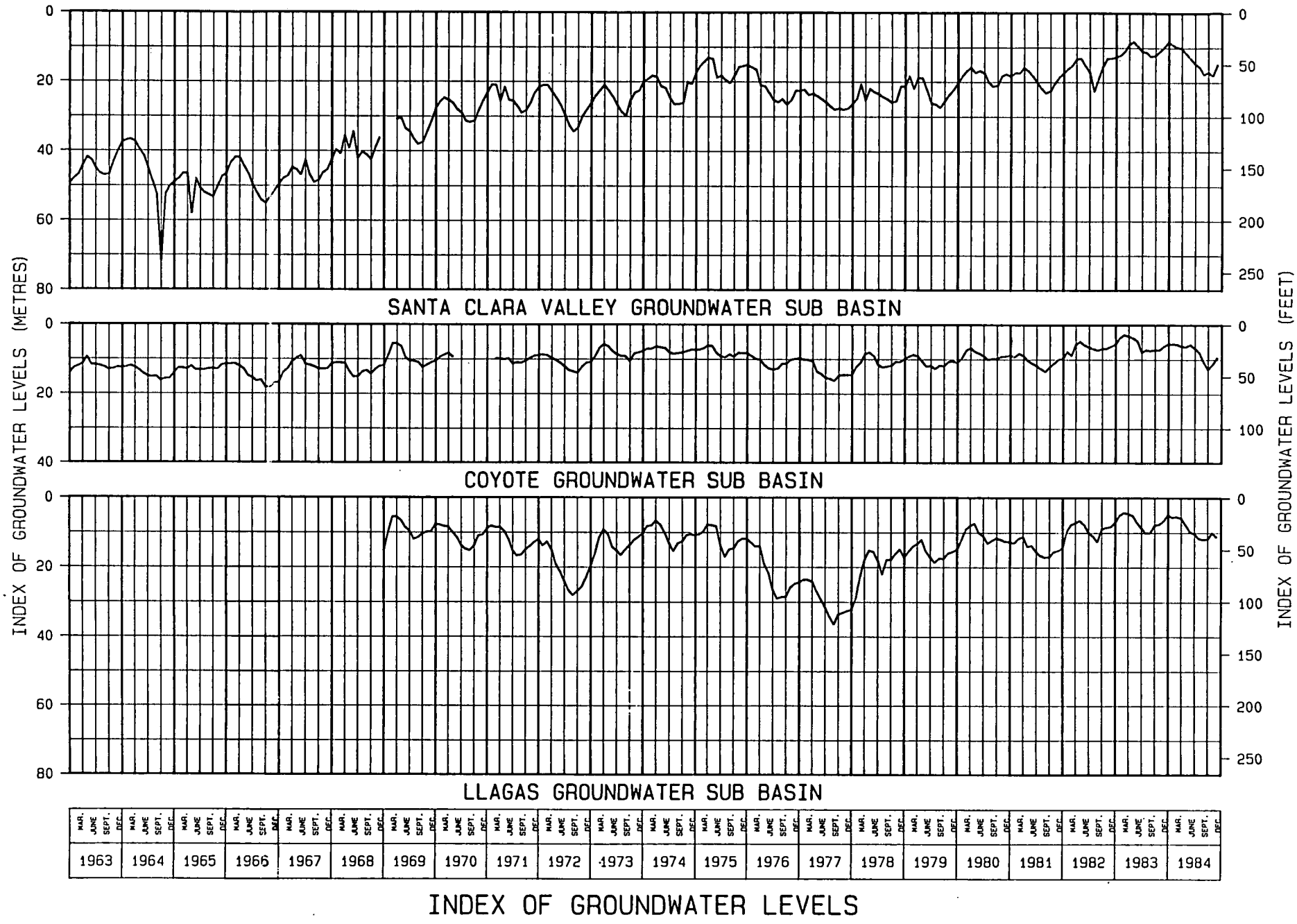

SANTA CLARA VALLEY GROUNDWATER SUB BASIN
COYOTE GROUNDWATER SUB BASIN
LLAGAS GROUNDWATER SUB BASIN
INDEX OF GROUNDWATER LEVELS (METRES)
INDEX OF GROUNDWATER LEVELS (FEET)
0
20
40
60
80
0
50
100
150
200
250
MAR.
JUNE
SEPT.
DEC.
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
INDEX OF GROUNDWATER LEVELS

FIGURE 4

In 1983-84, which was a below average rainfall year, a total of 109,000 acre-feet of water were recharged in the Santa Clara Valley Subbasin. About 83,000 acre-feet of water were recharged from reservoir supplies and about 14,000 acre-feet were recharged from imported South Bay Aqueduct water. About 12,000 acre-feet were estimated to have reached the groundwater from rainfall. Additionally, 6,000 acre-feet of water were recharged in the Coyote and Llagas Subbasins from Anderson Reservoir through the Main Avenue and Madrone Channel Recharge Facilities. The Llagas subbasin is also recharged by Gavilan Water Conservation District with water conserved in the Uvas and Chesbro reservoirs.

Land Surface Subsidence

Subsidence of the land surface occurs when intensive groundwater pumping results in lowered water pressures in the groundwater basin materials. These lowered water pressures increase the ability of the overburden load to compact the clay materials in and separating the aquifers. As a result, the clay materials consolidate with consequential sinking of the overlying land surface. The District established a single level circuit around the south end of San Francisco Bay that was run annually from 1963 to 1976. This line of levels has not been run since 1976 because the amount of land surface subsidence has been less than the accuracy of the leveling. This level circuit is planned to be run again in 1985-86 to update present subsidence data.

In 1960, the U.S. Geological Survey installed extensometers (compaction recorders) in 1,000 feet cased holes at the centers of subsidence, one in San Jose and another in Sunnyvale. These extensometers have recorded compaction of the confined aquifer system for over 20 years. Records from these instruments show that the compaction measured to a depth of 1,000 feet is about equal to the land surface subsidence as measured periodically by leveling of the bench marks.

According to Poland, "The subsidence in the Santa Clara Valley of California has been stopped by raising the artesian head in the aquifers until it equaled or exceeded the

maximum pore pressures in the aquitards. The compaction and water-level records being obtained by the Geological Survey indicate that if the artesian head can be maintained 10 to 20 feet above the levels of 1971-73, subsidence will not recur. On the other hand, subsidence will recommence if the artesian head is drawn down as much as 20 to 30 feet below the 1971-73, levels."[1/]

B. Precipitation

Rainfall is the source of all locally developed water supplies. The long-term precipitation at San Jose is illustrated in Figure 5 as the accumulated departure from the mean which denotes graphically the wet and dry periods of rainfall. The important feature in Figure 5 is the slope of the line; particularly whether it is positive (up) or negative (down). Each point is plotted as a difference from the long-term average; a wet year showing a positive difference and a dry or below normal rainfall year indicating a negative difference. If each difference is added to that of the previous year, a trend of positive or negative increments becomes apparent. An upward trend would, therefore, indicate a period of years which have received above normal rainfall and a downward trend would be indicative of a below normal period.

The accumulated departure from the mean is used to identify long-term wet and dry periods. Despite short term fluctuations, the long-term periods are easily discernible.

Beginning in 1875, rainfall approximated the long-term average until 1890 when a series of wet years began which generally continued until about 1916. The valley experienced low rainfall for several years following 1920 until 1935. It was during this drought period that valley residents first initiated a comprehensive water conservation program. The completion of the valley's first five water supply reservoirs in 1935

1/ Poland, Joseph F., "Land Subsidence in Santa Clara Valley, California", Water Spectrum, Department of the Army, Spring 1978, Vol. 10, No. 2.

ACCUMULATED ANNUAL DEPARTURE FROM 110-YEAR AVERAGE RAINFALL AT SAN JOSE

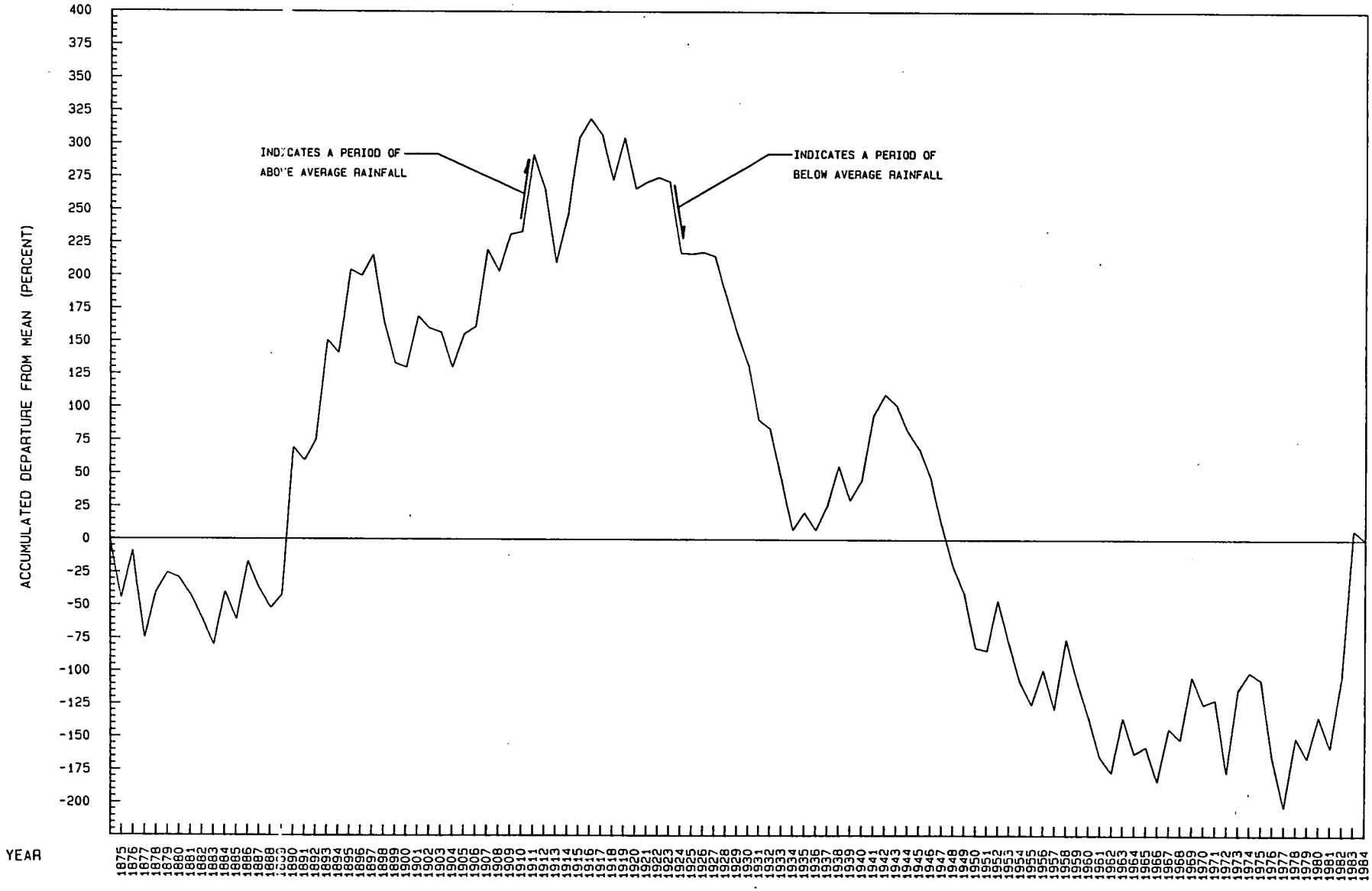


FIGURE 5

coincided with the beginning of a short interval of above-average rainfall. This enhanced the water supply picture and enabled groundwater levels, which had been declining, to recover.

Between 1943 and 1962, another series of dry years occurred. From 1962 to 1975, the valley rainfall was slightly above the long-term average. From 1975 to 1981, except for 1977-78 and 1979-80, rainfall was below average. In 1982 and 1983 rainfall was about 55 and 144 percent above average respectively, and in 1984 rainfall was about seven percent below normal.

Weather Modification

In its search for additional means of increasing its water supply, the District has been conducting cloudseeding operations since December of 1951.

Under natural conditions only a small amount of the moisture passing over the valley in the form of clouds ever reaches the ground as rain or snow. The function of a cloudseeding program is to increase total precipitation by introducing artificial nuclei into the clouds at the proper time and location.

The basic conditions for successful operation of the District's weather modification program occur when moisture-laden air masses from the Pacific Ocean are driven over the Santa Cruz Mountains by the westerly and southwesterly winds that prevail during storms. As these air masses approach the mountains, they are forced to rise abruptly, producing turbulence and rapid vertical velocities. When cloud droplets rapidly rise to altitudes above the freezing level, they form into ice crystals on dust, hydrocarbon particles, and other substances. When these ice crystals fall to an elevation where the temperature is above the freezing point, they melt, thereby forming raindrops which continue to collect moisture and grow larger as they fall to earth.

Minute crystals of silver iodide (AgI) also act as nucleating agents and are effective at higher temperatures than natural nuclei. One gram of silver iodide produces millions of nuclei. Ground-based generators located to the west and south of the main

watersheds are used to produce the silver iodide nuclei into the air which are then carried aloft by the rising air currents passing over the mountains.

Cloudseeding is a rain-increasing and not a rain-making process. During dry years, few, if any, opportunities exist for seeding. The increase in seasonal rainfall has been indicated to range between 10 percent and 20 percent for those years when cloudseeding was conducted. This corresponds to an increase of seven percent in mean annual precipitation.

There was no cloudseeding during the 1983-84 season.

C. Imported Water

The existing and proposed water import conveyance, treatment and distribution system for Santa Clara Valley is shown in Figure 6.

South Bay Aqueduct

The primary source of imported water for Santa Clara County is the South Bay Aqueduct. In 1983-84, 96,000 acre-feet of water was delivered into Santa Clara County through this facility. Of this total, 52,000 acre-feet was treated at the Rinconada Water Treatment Plant and 28,000 acre-feet was treated at the Penitencia Water Treatment Plant for delivery to consumers through retail water agencies. In addition, 673 acre-feet of raw water was delivered directly from District pipelines for use by individual contractors. The remaining 14,000 acre-feet was recharged into the underground water supply through the District's recharge facilities.

Hetch Hetchy

San Francisco Water Department's Hetch Hetchy Aqueduct provides a second source of imported water. During the fiscal year 1983-84, this system delivered 62,550 acre-feet directly to the water supply systems of the Cities of Milpitas, San Jose, Sunnyvale, Santa Clara, Mountain View, and Palo Alto and to the Purissima Hills Water District. Smaller amounts totalling 4,634 acre-feet of this water were also delivered to Stanford University, Moffett Field and Agnews State Hospital.

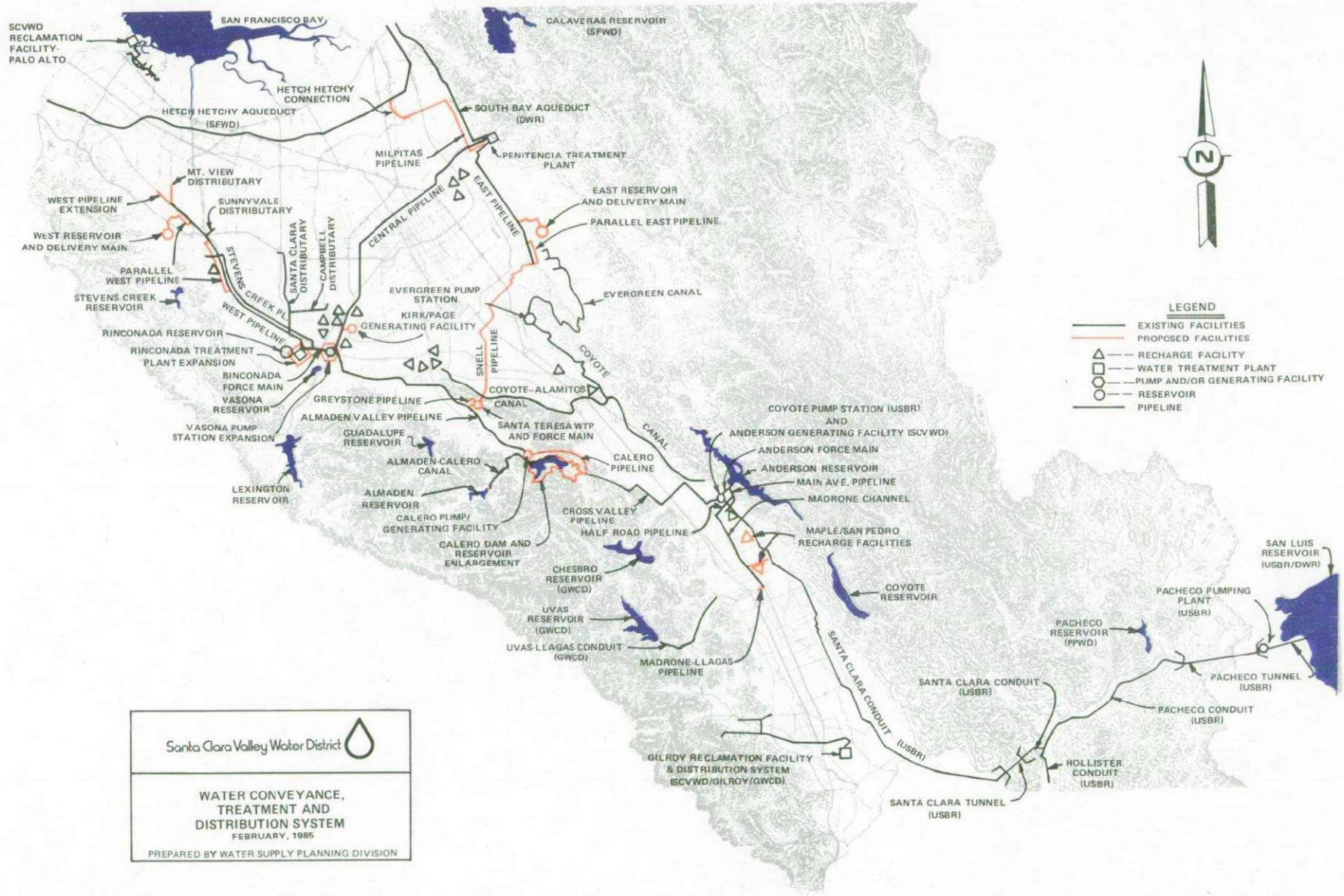

SCVWD RECLAMATION FACILITY-PALO ALTO
SAN FRANCISCO BAY
CALAVERAS RESERVOIR (SFWD)
HETCH HETCHY CONNECTION
HETCH HETCHY AQUEDUCT (SFWD)
SOUTH BAY AQUEDUCT (DWR)
MILPITAS PIPELINE
PENITENCIA TREATMENT PLANT
MT. VIEW DISTRIBUTARY
WEST PIPELINE EXTENSION
SUNNYVALE DISTRIBUTARY
WEST RESERVOIR AND DELIVERY MAIN
PARALLEL WEST PIPELINE
STEVENS CREEK RESERVOIR
STEVENS CREEK PL
WEST PIPELINE
SANTA CLARA DISTRIBUTARY
CAMPBELL DISTRIBUTARY
CENTRAL PIPELINE
EAST PIPELINE
EAST RESERVOIR AND DELIVERY MAIN
PARALLEL EAST PIPELINE
EVERGREEN PUMP STATION
EVERGREEN CANAL
KIRK/PAGE GENERATING FACILITY
RINCONADA RESERVOIR
RINCONADA TREATMENT PLANT EXPANSION
RINCONADA FORCE MAIN
VASONA RESERVOIR
VASONA PUMP STATION EXPANSION
LEXINGTON RESERVOIR
SNELL PIPELINE
COYOTE CANAL
COYOTE-ALAMITOS CANAL
GREYSTONE PIPELINE
ALMADEN VALLEY PIPELINE
GUADALUPE RESERVOIR
SANTA TERESA WTP AND FORCE MAIN
ALMADEN-CALERO CANAL
CALERO PIPELINE
ALMADEN RESERVOIR
CALERO PUMP/GENERATING FACILITY
CALERO DAM AND RESERVOIR ENLARGEMENT
CROSS VALLEY PIPELINE
HALF ROAD PIPELINE
CHESBRO RESERVOIR (GWCD)
UVAS RESERVOIR (GWCD)
UVAS-LLAGAS CONDUIT (GWCD)
MADRONE-LLAGAS PIPELINE
COYOTE PUMP STATION (USBR) AND ANDERSON GENERATING FACILITY (SCVWD)
ANDERSON FORCE MAIN
ANDERSON RESERVOIR
MAIN AVE. PIPELINE
MADRONE CHANNEL
MAPLE/SAN PEDRO RECHARGE FACILITIES
COYOTE RESERVOIR
SANTA CLARA CONDUIT (USBR)
GILROY RECLAMATION FACILITY & DISTRIBUTION SYSTEM (SCVWD/GILROY/GWCD)
SANTA CLARA TUNNEL (USBR)
HOLLISTER CONDUIT (USBR)
SANTA CLARA CONDUIT (USBR)
PACHECO CONDUIT (USBR)
PACHECO TUNNEL (USBR)
PACHECO RESERVOIR (PPWD)
PACHECO PUMPING PLANT (USBR)
SAN LUIS RESERVOIR (USBR/DWR)
N
LEGEND
EXISTING FACILITIES
PROPOSED FACILITIES
RECHARGE FACILITY
WATER TREATMENT PLANT
PUMP AND/OR GENERATING FACILITY
RESERVOIR
PIPELINE
Santa Clara Valley Water District
WATER CONVEYANCE, TREATMENT AND DISTRIBUTION SYSTEM
FEBRUARY, 1985
PREPARED BY WATER SUPPLY PLANNING DIVISION

Figure 6

San Felipe Project Status

Beginning in 1987, water from the San Felipe project is expected to be available to the District. The raw water will be conveyed through a series of pumping plants and pipelines which will interconnect the San Luis, Anderson and Calero Reservoirs.

These conveyance facilities include the Pacheco Pumping Plant, the Pacheco Tunnel and Conduit, the Santa Clara Tunnel and Conduit and the Coyote Pumping Plant which are Bureau of Reclamation facilities, and the Cross Valley Pipeline, the Calero Pipeline and the Almaden Valley Pipeline which are District facilities.

Bureau of Reclamation Facilities - As of September, 1984, construction of the Pacheco Pumping Station was 70% complete, the Pacheco Tunnel had been completed, and construction of the first ten miles of the Santa Clara conduit was 97% completed.

Santa Clara Valley Water District Facilities - Construction of the District's Distribution System also continued. As of the end of Fiscal Year 1983-84, Phase III of the Cross Valley Pipeline was completed and Phase IV was under construction.

On April 10, a contract for the construction of the Anderson Force Main project was awarded to Artukovich & Son for a bid of $4,340,611. This project will allow water to be released from Anderson Reservoir to the Cross Valley Pipeline for conveyance to Calero Reservoir.

The Calero Pipeline will follow McKean Road from the end of Phase III of the Cross Valley Pipeline in the hills above Calero Reservoir to the Almaden Pipeline near the base of Calero Dam. The work as of October 1, consisted of the preparation of the Engineer's Report and the EIR.

The Snell Pipeline is one of the key in-county key components recommended in the East Santa Clara Valley Water Supply Plan. It will convey treated water from the Santa Teresa Water Treatment Plant and tunnel to the southern terminus of the existing East Pipeline located at White and Aborn Roads. The pipeline will consist of approximately 45,000 feet of of pipe ranging from 60 to 72 inches in diameter. The present work

encompasses preparation of the Engineer's Report and the EIR for the Snell Pipeline. The Board has approved a contract for geotechnical consulting services with Wahler Associates. The field exploration is complete and laboratory tests are in progress. A contract for the EIR document preparation has been awarded to Engineering Sciences.

The Santa Teresa Water Treatment Plant will treat water imported through the San Felipe project. As of October 1, the draft EIR and the Engineer's Report has been completed for the project. This project will go to the Board of Directors for approval early in the 1984-85 Fiscal Year.

D. Water Conservation

The term "Water Conservation", as used in this report, refers to programs to manage and make the best use of water available to the District from all sources. "Water Savings" refers to efforts to reduce water use, a part of any water conservation program. The District's water conservation program, an integral part of its overall water management activities, includes local water storage facilities, wastewater reclamation, and water savings programs.

Local Storage Reservoirs

The District has constructed storage reservoirs on most of the major streams to retain seasonal runoff which is later released for groundwater recharge and direct surface irrigation. The District owns and operates eight dams and reservoirs with a combined capacity of about 155,000 acre-feet. Other public agencies in the County have constructed additional reservoirs with a total storage capacity of about 24,000 acre-feet. Another significant storage reservoir is San Jose Water Company's Lake Elsman with a capacity of about 7,500 acre-feet.

Table 2 shows the capacity, storage and percent full of all the reservoirs on October 1, 1983 and on October 1, 1984. On October 1, 1984, the total amount of water stored in all these reservoirs was 80,000 acre-feet which is 37,000 acre-feet less than on October 1, 1983. The storage in Gavilan Water Conservation District reservoirs

decreased by 8,000 acre-feet and the Pacheco Water District's reservoir decreased by 625 acre-feet during this period.

During the 1983-84 water year several of the District's reservoirs underwent maintenance or upgrading programs. Previous investigations have identified and delineated geologic features that might be hazards to safe operation of the District's dams and reservoirs. The District provided the Division of Safety of Dams with additional data regarding a landslide on the left abutment of Anderson Dam. The District had studied the landslide and concluded that it should not be considered a hazard. The Division of Safety of Dams also took an interest in a trace of the Coyote Creek Fault which may intersect the outlet pipe. Wahler Associates have completed the report on proposed improvements to the Anderson spillway in order to increase the capacity to the size required to pass the probable maximum flood. Staff is presently preparing the Engineer's Report on the project.

TABLE 2
RESERVOIR STORAGE
(Acre-Feet)

	Capacity		October 1, 1983		October 1, 1984	
Reservoir	Acre-Feet	Million Cubic Metres	Storage	Percent Full	Storage	Percent Full
Almaden	1,800	2.2	405	22.5	0	0
Anderson	91,300	112.6	80,990	88.7	49,995	54.8
Calero	10,200	12.5	6,150	60.7	3,319	33.0
Chesbro*	8,100	10.0	5,670	70.0	4,771	59.0
Coyote	23,700	29.2	0	0	11,808	49.9
Guadalupe	3,700	4.6	1,850	49.6	0	0
Lexington	20,200	24.9	11,110	55.0	6,699	33.2
Pacheco**	6,100	7.6	3,280	53.2	2,655	43.3
Stevens Creek	3,600	4.4	670	18.8	476	13.2
Uvas*	10,000	12.3	7,000	70.0	107	1.1
Vasona	400	0.5	390	95.2	342	83.4

* Gavilan Water Conservation District's Reservoirs

** Owned by Pacheco Pass Water District

Wahler Associates has completed the report on preliminary remedial design investigation of Stevens Creek Dam. It had been judged to be unsafe at full capacity in the event of a major earthquake. Field and laboratory work is complete and draft plans and specifications are 90% complete.

Water Reclamation

In its search for new sources of water, the District, as early as 1958, engaged a private consultant to explore methods to reclaim sewage and industrial wastewater. An oxidation pond was constructed adjacent to the San Jose Water Pollution Control Plant. Tests were conducted over a two-year period yielding valuable information for future efforts.

Presently, two water reclamation plants are in operation.

Water Reclamation Facility, Palo Alto - Operation of the Palo Alto Reclamation Facility began in June 1977. This facility can produce high-quality water at a rate of four million gallons daily by providing advanced wastewater treatment to effluent from the adjacent Palo Alto Regional Water Quality Control Plant. During 1983-84, no reclaimed water from the Palo Alto Reclamation Facility was produced.

Water Reclamation Facility, Gilroy - The wastewater reclamation facility in Gilroy was constructed under an emergency program to combat the severe overdraft of a limited underground subbasin and meet the need for new water supplies in the Gilroy area during the drought of 1976-77. The facility was constructed jointly by the Santa Clara Valley Water District, the City of Gilroy, and the Gavilan Water Conservation District.

The treatment system takes primary effluent from the City of Gilroy domestic sewage treatment plant and provides secondary treatment in an oxidation pond. The recycled water is used for agriculture and landscape irrigation. During 1983-84, the amount of reclaimed water sold was 222 acre-feet.

Water Savings Program

Water savings is and always has been an integral part of the District's overall water supply program. During the 1977 drought, the District established an emergency goal of a 25

percent reduction in water use. This goal was later reduced to maintain a water savings of at least ten percent on the basis of pre-drought levels of use in order to ensure a balanced water supply for the future. All recent studies of future demand and required supplies have included the effects of such a reduction.

In mid-1980, the Department of Water Resources, Office of Water Conservation, the SCVWD and the City of San Jose, undertook a campaign to reduce consumption of water and to reduce flows to the sewage treatment plant. The water savings program consisted of distributing and promoting installation of water conservation kit devices to 475,000 households in Santa Clara County. Savings from this program are estimated to be about four thousand acre-feet per year.

V. WATER QUALITY

To aid in the management and protection of the quality of all the waters in the valley, the District monitors the quality of waters in the streams, surface reservoirs, and the underground subbasins.

A. Streams

The stream surface water quality monitoring program established in 1980-81 consisted of sampling 11 stream stations. These sampling stations were located at streamflow stations and were sampled during the report period for specific conductance, pH, temperature, DO, hardnesses, Ca, Mg, Na, SAR, sodium percent, K, alkalinity, SO_4, Cl, F, SiO_2, solids, total and dissolved Nitrogen (NO_2, NO_3, NH_3 and organic), total phosphorus, dissolved metals (Al, B, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn), and TOC and total and fecal coliform.

Except for the bacterial work, the metals and TOC, which were measured twice, all parameters were measured eight times each year. The stream sampling stations are located at the following streamflow stations:

Los Gatos Creek

Station 67	-	below Lexington Reservoir
Station 59	-	at Lark Avenue
Station 50	-	at Lincoln Avenue

Guadalupe Creek

Station 43	-	at Los Gatos Golf Course
Station 20	-	at Alamitos Recharge System
Station 16900	-	downtown San Jose

Coyote Creek

Station 9	-	below Anderson Reservoir
Station 58	-	at Edenvale

Llagas Creek

Station 69	-	below Chesbro Reservoir
Station 11158555	-	25 feet upstream of Machado School
Station 11153530	-	at San Martin Avenue

The data collected will be used to identify long term variations in quality and evaluate the effects of change in land use and other activities on the quality of water in streams in Santa Clara County. A report containing all the data collected and its evaluation will be completed in 1984.

B. Reservoirs

In 1974 the District began conducting limnologic investigations of the conservation reservoirs. Limnology is the study of physical, chemical, and biological conditions of a freshwater body, and its tributary streams and watershed. During 1982-83 the limnologic program consisted of: (1) ongoing limnologic monitoring of Anderson Reservoir; (2) ongoing limnologic investigation of Lexington Reservoir and (3) continuation of the detailed investigation at Calero Reservoir. The Calero Limnologic Investigation Report is under preparation.

The product of these investigations is a collection of adequate base line water quality data for each reservoir. Evaluation of the information collected during regular monitoring and observation of water quality trends aids in the identification of sources of contamination, will aid in predicting the impact of projected land use changes in the watersheds and will be a valuable tool in the selection of reservoir operation criteria.

Data being collected at Calero Reservoir will be used to assess the treatability as a source of water to the future Santa Teresa Water Treatment Plant.

C. Groundwater

As of September 30, 1984, about 85 sites have been added to the list under investigation by the California Regional Water Quality Control Board. The incidents of contamination with organic chemicals tend to be centered around the areas of Palo Alto, Mountain View, Sunnyvale, Santa Clara and north San Jose, otherwise know as the Silicon Valley. One reason for this is that many various chemicals are used extensively by the electronics industry which is centered in that area and, therefore, there are numerous storage facilities there.

There are also two major cases located in the Blossom Valley area of south San Jose in the unprotected forebay area of the groundwater basin in Blossom Valley. Although it will take years to clean up these sites, the areas of contamination associated with each of these leaks are well defined and considered to be under control. However, these two cases are of particular concern because of their potential to readily contaminate the deeper confined portion of the groundwater basin. There has, in fact, been trace levels of contamination found in water supply wells drawing water from the confined portion of the aquifer, the source of which is believed to be the Blossom Valley forebay area. Therefore, groundwater produced from this area is monitored quite frequently for a wide range of chemical constituents to insure the safety of the drinking water supply and one well has been removed from service.

In addition to the above mentioned localized monitoring, recent state legislation (AB 1803) is now requiring all private and municipal treated water retailers to test representative wells in their water system for organic chemical contamination. As of September 30, 1984, results of this sampling program are not available.

The incidents of groundwater contamination in the Silicon Valley area are not considered to be as serious a threat to the drinking water supply of the general public as contamination found in the forebay zone because of the natural protection afforded by the geology in the Silicon Valley area. A thick clay layer underlies that area which separates the shallow aquifer from the deeper, heavily pumped aquifer. The shallow aquifer is more susceptable to contamination from surface sources, but the water drawn from there is used to supply only a small number of private wells, mostly for irrigation purposes.

The deeper aquifer is of major importance to the water supply of the general public and the protection of that aquifer is a primary goal of the District. In order to protect the deep aquifer from contamination, the District has embarked on a program intended to seal abandoned or out-of-service wells which might serve as conduits for contaminated water in the shallow aquifer to travel down to the deep aquifer.

In addition to the groundwater chemical contamination described above, there are localized areas in the County that have yielded groundwater of poor quality as a result of contamination from surface waters or degradation from subsurface sources. In the summer of 1979 the Department of Water Resources confirmed the high levels of nitrates in the San Martin area, earlier found by the Central Coast Regional Water Quality Control Board. A special water quality study to identify sources of the nitrate in the San Martin area was completed by a consultant under the director of the Santa Clara County Planning Department. This study concluded that the quality of the water in this area is generally good except for the high nitrate content. The principal sources of nitrates entering the Llagas groundwater subbasin in San Martin were found to be effluent from individual waste treatment and disposal systems and nitrate from fertilizers carried by irrigation water that percolates through the soil.

Another area of groundwater degradation is in the Santa Cruz Mountains above Lexington Reservoir where the Santa Clara County Health Department has obtained samples of water from domestic wells that do not meet drinking water standards. Information gathered from the surveys conducted showed that the source of groundwater contamination were on-site treatment and disposal wastewater system which were not maintained or were designed with insufficient capacity for the present loading. In addition, many original septic tanks have deteriorated and collapsed and leach field pipes have been crushed. Several alternative solutions are being studied by the Santa Clara County Board of Supervisors.

A continuing groundwater quality concern is saltwater intrusion into fresh aquifers. Saltwater intrusion has occurred in aquifers along the Baylands area bordering South San Francisco Bay in Santa Clara County. Recognizing the problem, SCVWD conducted a study to assess existing conditions and to evaluate possible actions that would be required to prevent or minimize further intrusion. The study concluded that presently, saltwater is mostly contained within the upper aquifer (above 150 feet) in depth. However, some areas of the main aquifer (below 150 feet) also contain saltwater.

Saltwater is most likely finding its way through defective or improperly sealed or abandoned wells. Based upon these findings, SCVWD staff designed a project to alleviate this situation. The project has been approved for grant funding under the State Clean Water Assistance Program. The project is expected to take four years to complete and will cost about $293,000 of which is about $212,000 will be grant funded.

The Saltwater Intrusion Prevention project objective is to locate and have sealed or repaired old wells which were not properly constructed or maintained or have been abandoned or destroyed and are probably providing conduits for interaquifer transfer of saltwater. This will prevent or substantially reduce the possibility of further degradation of the lower aquifer.

VI. GLOSSARY*

Acre-Foot - A measurement of volume of water equaling 43,560 cubic feet or 325,851 gallons, an amount that would cover an area of an acre, one foot deep (a football field would be covered one and a quarter feet deep).

Aquifer - A geologic formation that stores, transmits, and yields significant quantities of water to wells and springs.

Aquitard - A geologic formation which, although porous and may store large quantities of water, will not transmit water fast enough to yield an appreciable supply for a well.

Artesian Well - A well in which water is lifted by hydrostatic pressure above the land surface at the well.

Biochemical Oxygen Demand (BOD) - The quantity of oxygen consumed in biological processes that decompose organic matter in water.

Confined Aquifer - An aquifer overlain by material sufficiently impervious to retain groundwater in the aquifer under pressure.

Connate Water - Water which was entrapped in a geologic formation at the time the formation was deposited. If the formation was deposited in the ocean or a saline lake, the connate water is also saline.

Consumptive Use - Water consumed by vegetative growth in transpiration and building of plant tissue, and water evaporated from adjacent soil, from water surfaces, and from foliage. Also, water similarly consumed and evaporated by urban and nonvegetative types of land use.

Contamination - An impairment of the quality of water by micro-organisms, chemicals, sewage, or industrial waste which renders the water unfit for its intended use. In California, this means the water constitutes an actual hazard to public health (see also Pollution).

Cubic Feet Per Second (CFS) - A unit of measurement of flowing water; the number of cubic feet of water which passes a given point in a second.

Dissolved Oxygen (D.O.) - The oxygen dissolved in water. It is essential for aquatic life.

Dry Period - An historic period of years when water supply is much below normal. An example was 1929-34 when the water in northern California streams averaged only about 38 percent of normal. It has been used as the reference drought situation in much water resource planning.

Evaporation - The process by which surface or subsurface water is converted to atmospheric vapor.

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* From Santa Clara Valley Water District's "Glossary of Terms", April, 1977.

Evapotranspiration - Water withdrawn from soil by evaporation and plant transpiration (a consumptive use).

Flood Insurance - The transfer of the risk of monetary loss due to flooding to another in accordance with the National Flood Insurance Program.

Floodplain - The relatively flat area adjoining a river or lake that may be covered by floodwater.

Gradient - The rate of change per unit of length, such as the slope of the land, stream channel, or any surface.

Groundwater - Subsurface water in saturated porous rocks and soils.

Groundwater Basin - Areas where water is stored below the ground surface.

Groundwater Recharge - The process whereby water seeps from the surface down through soil materials to become groundwater.

Groundwater Recharge Basins - Depressions where water is placed so that it can seep into the ground.

Hydrologic Cycle - The circuit of water movement from the atmosphere to the earth and return to the atmosphere through various stages of precipitation, consequent runoff, streamflow, infiltration and underground movement, eventual evaporation, and reprecipitation.

Hydrology - The applied science concerned with the waters of the earth in all its states - their occurrences, distribution, and circulation through the unending hydrologic cycle.

Hydrology, Groundwater - The branch of hydrology that deals with groundwater, its occurrence, movement, replenishment, and depletion.

Imported Water - Water that is moved from one drainage basin to another. (Example: Water is moved from the Sacramento-San Joaquin Valleys through canals and pipelines into the Santa Clara Valley.)

Infiltration - The movement of water through the soil surface and into the soil.

Injection Well - Well used for introduction water into an aquifer. Technique used to stop seawater intrusion, replenish an aquifer, or dispose of cooling water.

Overdraft - The condition in a groundwater basin where the amount of water withdrawn by pumping exceeds the amount of water replenishing the basin over a long time period.

Perched Groundwater - Groundwater occurring in a saturated zone separated from the main body of groundwater by unsaturated rock (or soil).

Percolation - The movement of water, under natural pressures developed underground, through the interstices of the rock or soil.

Percolation Pond - See Groundwater Recharge Basin.

Permeability - A measure of the ability of a material to convey water.

Piezometric Level - The level to which water will rise in a well that penetrates a confined aquifer.

Point Source - Any discernible confined and discrete conveyance from which pollutants are or may be discharged.

Pollution -The addition of sewage, industrial wastes, or other harmful or objectionable material to water (see also Contamination).

Potable Water - Water which does not contain objectionable pollution, contamination, minerals, or infection and is considered satisfactory for domestic consumption.

Precipitation - The total measurable supply of water received from clouds as rain, snow, hail, or sleet.

Primary Treatment - The first major stage in wastewater treatment, usually sedimentation. Floating and settleable solids are removed in this stage.

Salinity - The concentration of salts dissolved in water.

Secondary Treatment - The second major step in wastewater treatment using biological methods to decompose the organic wastes carried by the water.

Semiperched Groundwater - Shallow groundwater overlying a body of groundwater from which it is not separated by any unsaturated alluvium (perched groundwater but not separated by an unsaturated zone from the main groundwater body; separation is achieved by the nearly impermeable nature of the perching clay layer and if the main groundwater body were drawn down, a true perching condition would result).

Spreading Dam - A low artificial barrier built in a stream to pond water to increase groundwater recharge capacity.

Subsurface Inflow - Underground waters of the hills and mountains or adjacent groundwater basins that move into the groundwater basin under consideration. This water is subsurface outflow from the hills and mountains or the adjacent grondwater basin.

Surface Diversion - The taking of water from a stream or other body of surface water into a canal, pipeline, or other conduit.

Surface Water - Water that rests on the surface of the earth, such as streams and rivers, ponds, lakes, and reservoirs.

Suspended Solids (SS) - Small particles of matter that are carried in suspension in water.

Tertiary - Treatment processes in addition to the normal secondary treatment of wastewaters. Generally, these are chemical and physical processes.

Total Dissolved Solids (TDS) - The amount of organic and inorganic matter (by weight) dissolved in a given quantity of water. It is usually stated in parts per million (ppm) or milligrams per liter (mg/l).

Treated Water - Water that has been treated to make it suitable for domestic service (see Potable Water).

Turbidity - A measure of fine suspended matter (usually colloidal) in liquids. The fine particles may be visible as a bulk unit but are not large enough to be seen as individual particles by the naked eye; in total they restrict the passage of light through the liquid.

Unconfined Aquifer - An aquifer such that the piezometric surface of the groundwater retained within it falls below the bottom of any upper confining bed.

Water Quality - The chemical, physical, and biological properties of water which affect its suitability for use.

Watershed - The land area from which water drains to a given point (a drainage area, drainage basin, or catchment area).

Water Table - The surface where groundwater is encountered in a well in an unconfined aquifer.

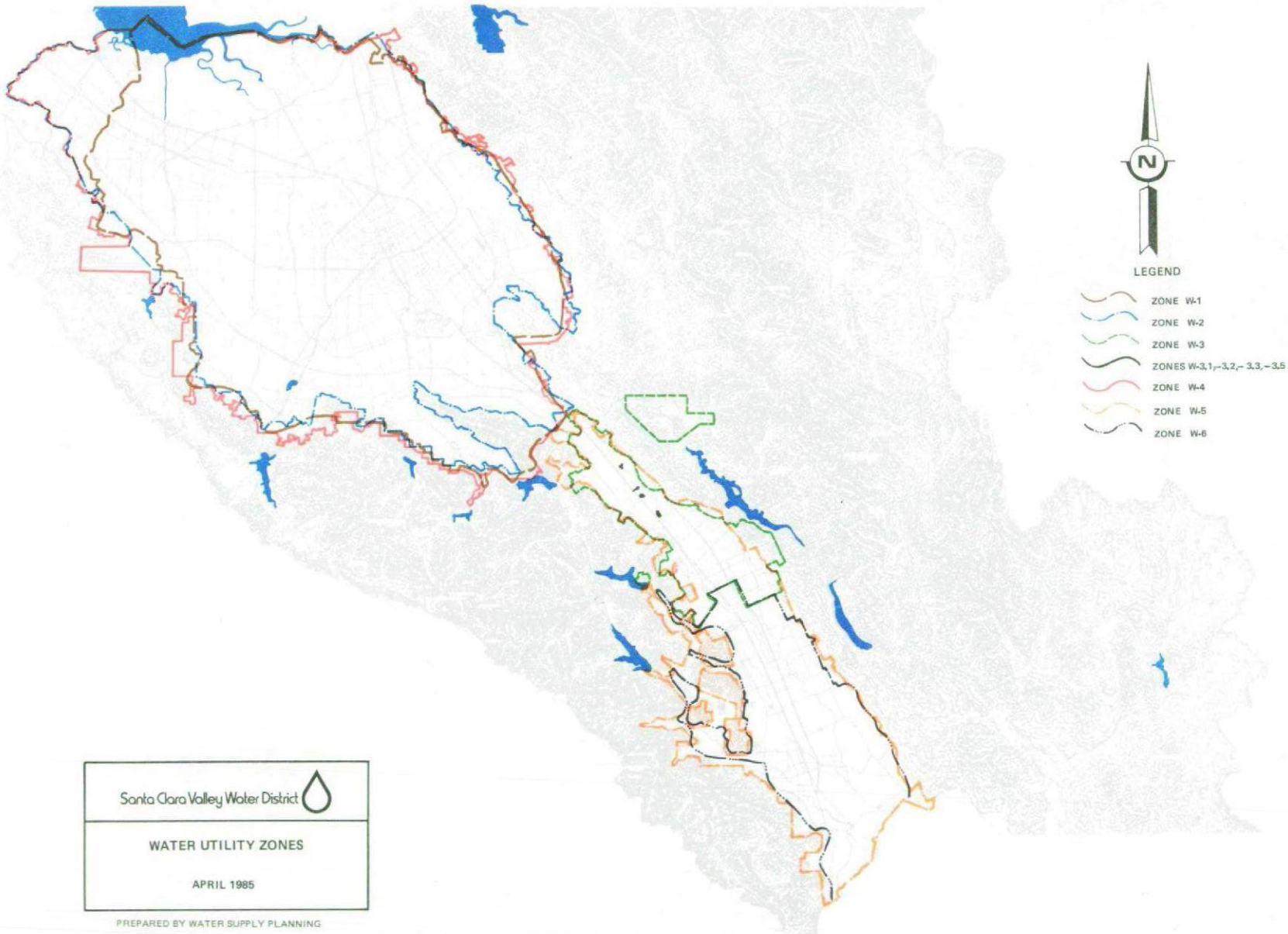
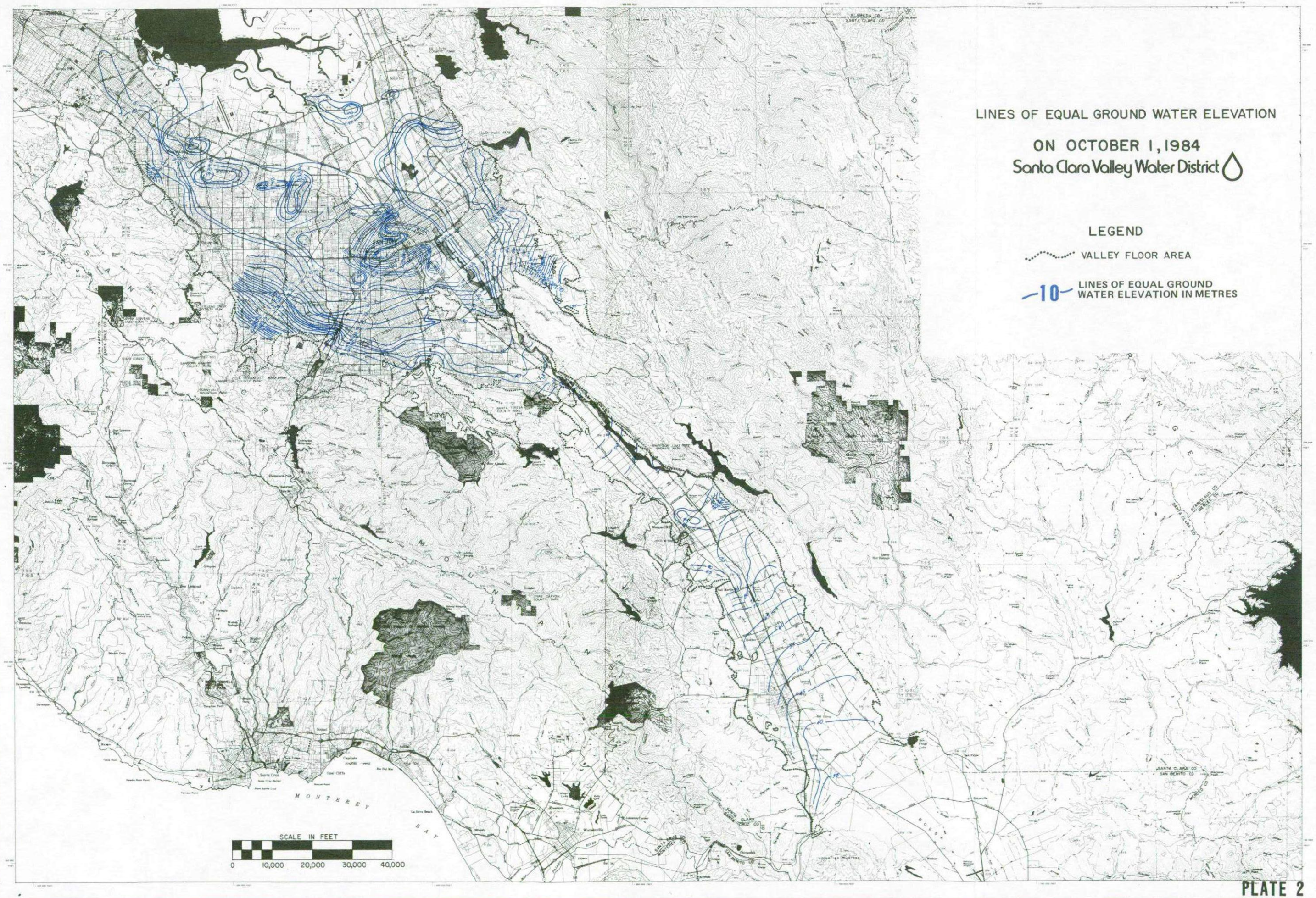

N
LEGEND
ZONE W-1
ZONE W-2
ZONE W-3
ZONES W-3.1,-3.2,- 3.3,-3.5
ZONE W-4
ZONE W-5
ZONE W-6
Santa Clara Valley Water District
WATER UTILITY ZONES
APRIL 1985
PREPARED BY WATER SUPPLY PLANNING

PLATE 1


LINES OF EQUAL GROUND WATER ELEVATION
ON OCTOBER 1, 1984
Santa Clara Valley Water District
LEGEND
VALLEY FLOOR AREA
10
LINES OF EQUAL GROUND WATER ELEVATION IN METRES
SCALE IN FEET
0
10,000
20,000
30,000
40,000
MONTEREY BAY
SANTA CRUZ MOUNTAINS
ALAMEDA CO
SANTA CLARA CO
SAN MATEO CO
SANTA CRUZ CO
SAN BENITO CO
STANISLAUS CO
MERCED CO
Santa Cruz
Watsonville
Morgan Hill
Gilroy
Hollister
Los Gatos
Saratoga
Cupertino
Sunnyvale
Mountain View
Palo Alto
Menlo Park
Redwood City
Los Altos
Milpitas
San Jose
Alum Rock
Almaden
Calero
Coyote
Anderson
Stevens Creek
Lexington
Uvas
Chesbro
Pacheco
Hernandez
Bear Creek
Leroy Anderson
Vasona
Lake Elizabeth
Ford
Ogier
Calero
Almaden
Guadalupe
Alum Rock
Santa Teresa County Park
Sierra Vista
Ohlone
Coyote Ridge
Pacheco Pass
Dunneville
Gilroy Hot Springs
Hot Springs
Gilroy
Morgan Hill
Coyote
Hollister
Tres Pinos
Paicines
Aromas
Watsonville
Corralitos
Freedom
Aptos
Soquel
Capitola
Santa Cruz
Opal Cliffs
Bonny Doon
Felton
Ben Lomond
Scotts Valley
Boulder Creek
Zayante
Felt Lake
Felt Mountain
Felt Peak
Felt Ridge
Felt Springs
Felt Station
Felt Valley
Felt Canyon
Felt Creek

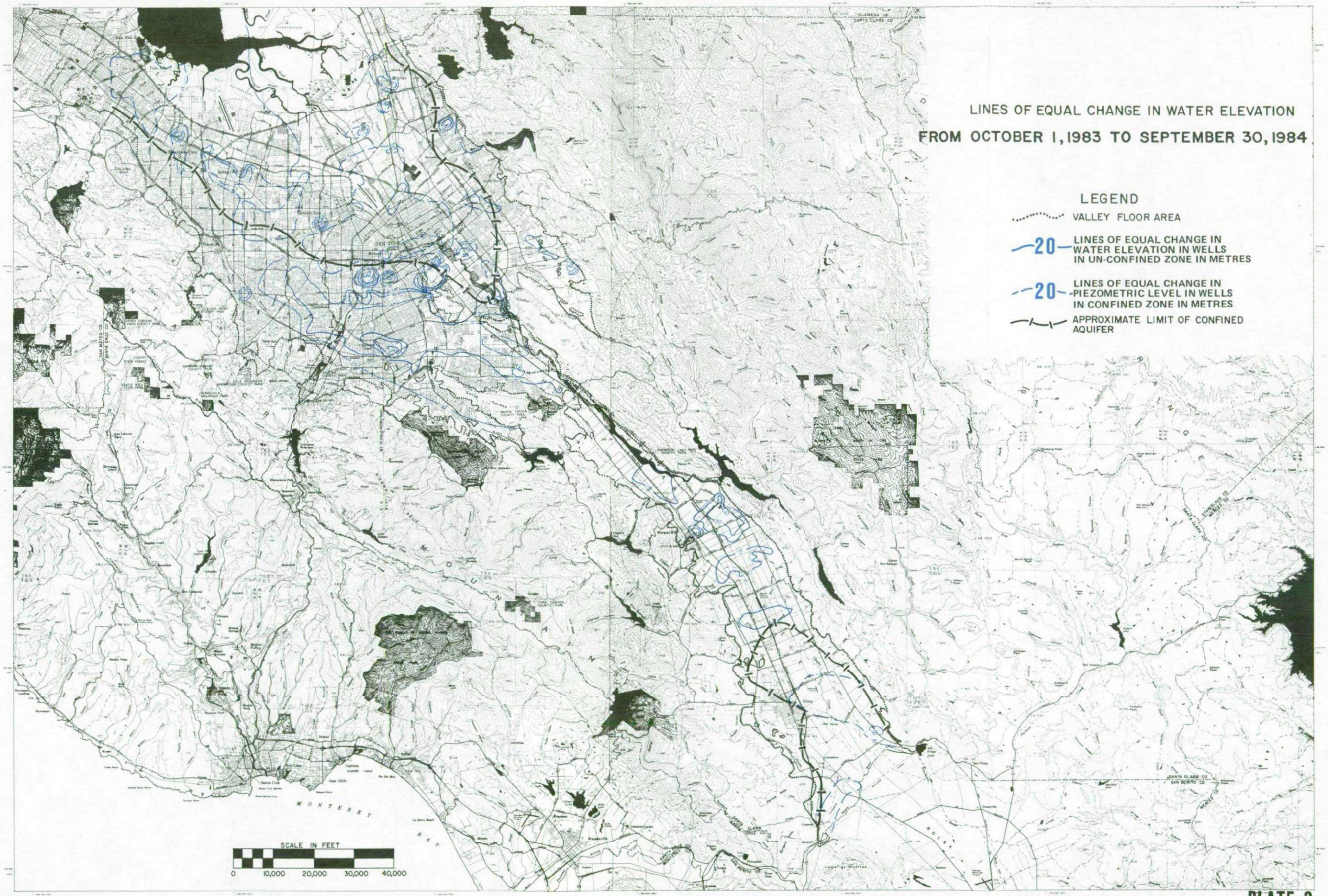

LINES OF EQUAL CHANGE IN WATER ELEVATION
FROM OCTOBER 1, 1983 TO SEPTEMBER 30, 1984
LEGEND
VALLEY FLOOR AREA
20 LINES OF EQUAL CHANGE IN WATER ELEVATION IN WELLS IN UN-CONFINED ZONE IN METRES
20 LINES OF EQUAL CHANGE IN PIEZOMETRIC LEVEL IN WELLS IN CONFINED ZONE IN METRES
APPROXIMATE LIMIT OF CONFINED AQUIFER
SCALE IN FEET
0 10,000 20,000 30,000 40,000
MONTEREY BAY
SANTA CRUZ MOUNTAINS
SAN JOSE
Santa Cruz
Watsonville
ALAMEDA CO
SANTA CLARA CO
SAN MATEO CO
SANTA CRUZ CO
SAN BENITO CO
MONTEREY CO

PLATE 3

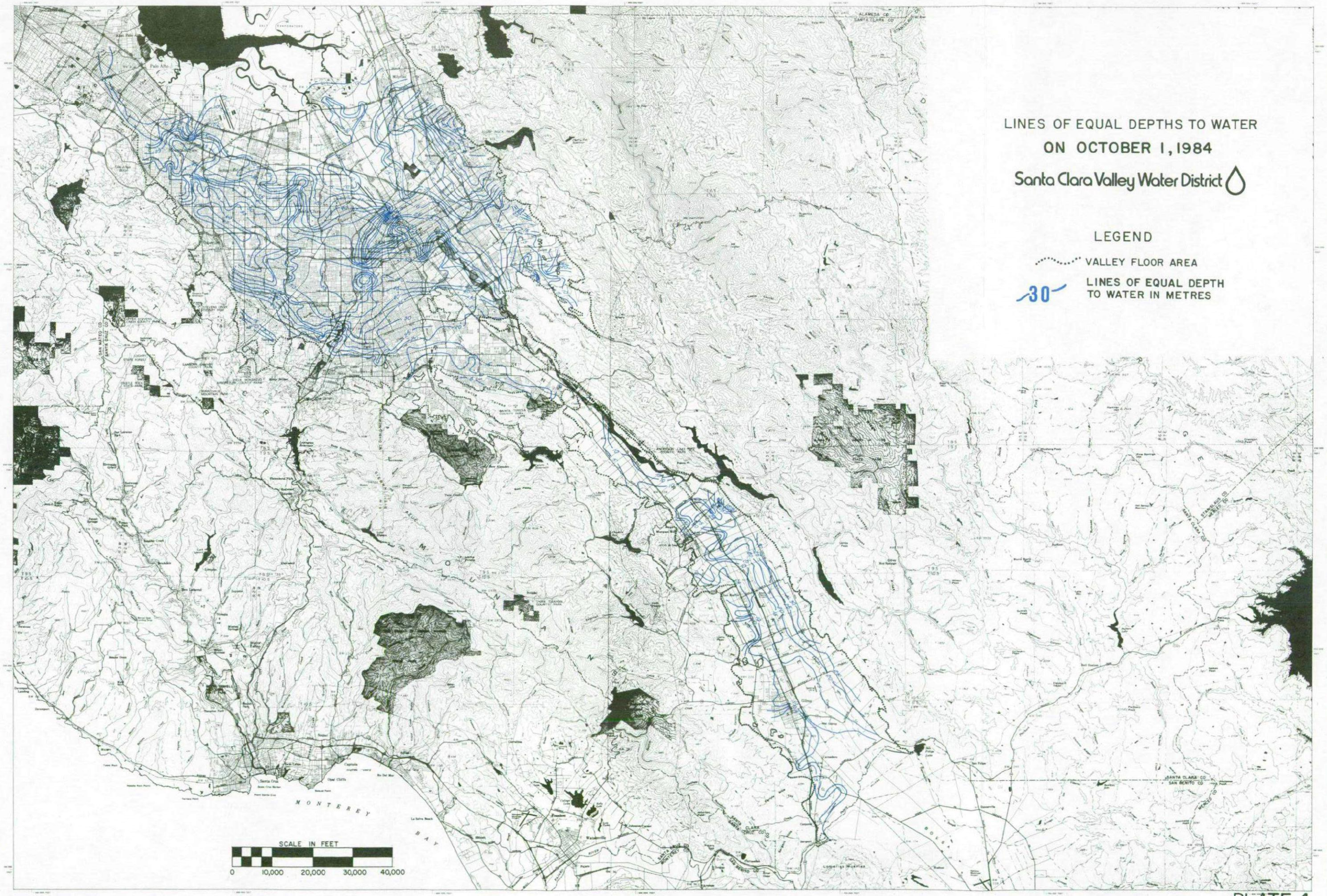

LINES OF EQUAL DEPTHS TO WATER
ON OCTOBER 1, 1984
Santa Clara Valley Water District
LEGEND
VALLEY FLOOR AREA
30
LINES OF EQUAL DEPTH TO WATER IN METRES
SCALE IN FEET
0
10,000
20,000
30,000
40,000
MONTEREY BAY
SANTA CRUZ MOUNTAINS
Palo Alto
Santa Cruz
Capitola
Watsonville
San Felipe
ALAMEDA CO
SANTA CLARA CO
SANTA CRUZ CO
SAN BENITO CO
MONTEREY CO

PLATE 4